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(54) **AN ANTIMICROBIALLY ACTIVE, NON-WOVEN WEB USED IN A WET WIPER.**

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US-A- 4 414 268

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Description

BACKGROUND OF THE INVENTION

The present invention relates to non-woven webs and, more particularly, to antimicrobially active, non-woven webs, to wet wipers containing such a web, and to a method of making the web.

Wet wiper products including those utilizing non-woven and air-laid webs, require antimicrobial properties to destroy or inhibit the growth of various microorganisms; bacteria, yeasts, and molds. Presently, there are at least four methods of treating the fabric of the wet wiper product to obtain some type of antimicrobial protection - sterilization; pore size control, such as Bacterial Filtration Efficiency (BFE); chemical surface treatment; and overall chemical protection. All of these methods have demonstrated inherent deficiencies for wet wiper products.

Sterilization may be achieved by sterilizing the raw materials going into the make-up of the product and/or sterilizing the final packaged product. Sterilization is an excellent technique for killing the microorganisms present to provide a microbiologically clean product for the intended use. However, in the case of wet wipers, sterilization as an antimicrobial technique is limited because once the product packaged has been opened to dispense the wipers, the sterilization is voided and any remaining wipers are exposed to and therefore subject to microbiological growth. As a result, the product is rendered both useless and potentially harmful.

Therefore, sterilization is viable only for single use packages of wet wipers. Nevertheless, due to shelf life and package integrity concerns, all single use wet wiper packages commercially available still rely on additional chemical protection for good microbiological control.

Fabric pore size control by BFE can be used to control the passage of microorganisms from one side or surface of the fabric through the fabric to the other side or surface. Pore size control as a method of microbiological transport control is generally used only with a dry fabric and is found most frequently in the medical industry in such products as CSR wraps and face masks. This method of microorganism transport control is ineffective for use in a wet wiper, because any microorganisms present can pass entirely around the fabric in the liquid or lotion phase of the product.

Antimicrobial surface treatment of a fabric may also be beneficial in the dry mode of usage, where, along with the pore size control by BFE, microorganisms are either filtered out and/or killed upon contact with the surface of the fabric. However, again in the case of wet wipers, surface treatment of the fabric has been shown to be insufficient to obtain the necessary microbiological control. The liquid or lotion phase of the wet wiper product penetrates into the interstices of the fabric to carry the microorganisms past the treated surface into the interstices of the fabric, where they may grow and multiply.

Virtually the only method of antimicrobial control and protection presently used in wet wiper products is that which is achieved by a chemical permeation of preservative agents throughout the wet wiper product. This permeation may be achieved by padding the wiper fabric during its manufacture and/or by incorporating the chemicals in the liquid or lotion phase of the wiper product.

Padding the fabric is generaly not used as a commercial technique because of the additional manufacturing processing costs. Since a liquid or lotion must be applied to the fabric anyway in a wet wiper product, and since the liquid or lotion without antimicrobial control or preservation agents represents a key opportunity for microbiological growth, the preferred method of applying the chemical preservation or antimicrobial control is to incorporate the soluble preservative agents in the lotion phase and then apply the preserved lotion to the fabric.

In either case, the end result is the same. Since the preservatives and antimicrobial agents are soluble in a liquid or lotion phase, they ultimately equilibrate throughout the wet wiper product and provide a homogenous chemical method of antimicrobial control. Unfortunately, when a wet wiper product of this type is ultimately used, the preservatives or antimicrobial agents remain behind on the user's skin from the liquid or lotion phase and leave an irritating residue on the skin. Many individuals exhibit adverse reactions to such preservatives, and hence, their enjoyable use of the wet wiper product is significantly impeded.

Moreover, both chemical solubility and antimicrobial spectrum activity considerations signficantly limit the use of other, less harsh preservatives in the liquid wetting solution. Consequently, the present use of the wet wiper products, such as those that use non-woven webs, has numerous inherent disadvantages.

Therefore, it would be desirable to incorporate the antimicrobial properties required in the wet wiper product in a manner substantive to and within the wet wiper fabric. In this manner, the issues of chemical solubility and antimicrobial activity considerations could be overcome because no harmful residue would be left on the skin of the user. In addition, the increased costs of padding the wet wiper fabric during its manufacturing process could be overcome by incorporating these substantive antimicrobials into the

synthetic bonding agent typically already required for such non-woven fabrics.

EP-A-O 113 254 describes a non-woven fabric having an antimicrobial agent incorporated in a colloidal suspension within the amorphous zones of a polymeric binder permitting migration of the antimicrobial zones of a polymeric binder permitting migration of the antimicrobial agent. US-A- 4 414 268 and US-A- 4 395 454 describe non-woven adsorbent materials which are surface tested with a non-leachable bioactive silicone quaternary amine.

In sum, present non-woven web products that exhibit antimicrobial activity are less than satisfactory. Often, the webs contain preservatives that leave an irritating residue on the user's skin. Moreover, the use of various synthetic fibers and off-line treatment processes increase the cost of producing these non-woven web products.

SUMMARY OF THE INVENTION

Quite surprisingly, the inventor of the present invention has developed an antimicrobially active, non-woven web that overcomes the significant and inherent disadvantages present in previous non-woven webs that attempt to exhibit antimicrobial and wet wiper properties. Unlike previous webs, the non-woven web of the present invention need not be maintained in a preservative containing solution that contains irritating chemicals and leaves harmful residues on the skin of the user. Moreover, the present invention utilizes currently existing and preferred processing techniques for application of the substantive antimicrobial agent, thereby reducing the cost of manufacture.

The present invention achieves these various advantages by providing a method for making an antimicrobially active, non-woven web. The method comprises the steps of: (a) forming an unbonded fibrous web; (b) applying throughout the unbonded fibrous web an uncured binder and an antimicrobial agent, the antimicrobial agent being substantive to the fibers of the web and to the binder when the web is either wet or dry; and (c) curing the binder to bind the fibers together to form an antimicrobially active, non-woven web. Preferably, the antimicrobial agent is an organo-silicon quaternary ammonium salt, such as a silyl-quaternary ammonium salt. Particularly preferred antimicrobial agents are 3-(trimethoxysilyl) propyldidecylmethyl ammonium salt and 3-(trimethoxysilyl) propyloctadecyldimethyl ammonium salt. Other such substantive antimicrobial agents may be recognized by those familiar with the art.

The antimicrobially active, non-woven web formed by the present invention comprises: (a) bonded fibers; (b) a binder substantially uniformly distributed on the fibers, the binder being present in an amount effective to bind the fibers; and (c) an antimicrobial agent substantially uniformly distributed on the fibers, the antimicrobial agent being substantive to the fibers and to the binder when the web is either wet or dry.

These non-woven webs can be used to form an antimicrobially active, wet wiper that comprises: (a) an antimicrobially active, non-woven web as defined above and (b) a substantially preservative free liquid in which the web is maintained in a wet condition until use.

The present invention overcomes the numerous inherent disadvantages commonly associated with previous antimicrobially active non-woven webs and obtains the various advantages of the invention. By no longer requiring the presence of a preservative in the surrounding solution, the non-woven web product of the present invention avoids leaving an irritating residue on the user's skin. Consequently, the present invention significantly advances over the state of the art.

The foregoing and other features and advantages of the present invention will be made more apparent from the following description of the preferred embodiments.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The method of the present invention produces an antimicrobially active, non-woven web. Initially, the present method forms an unbonded fibrous web. An uncured binder and an antimicrobial agent are then applied throughout the unbonded fibrous web, with the antimicrobial agent being substantive to both the fibers of the web and to the binder when the web is either wet or dry. After application of the binder and the antimicrobial agent, the binder is cured to bind the fibers together to form an antimicrobially active, non-woven web.

In accordance with the present invention, in the first step of the method, an unbonded fibrous web is formed. Although various cellulosic and synthetic fibers known in the art can be effectively used, the fibers are preferably cellulosic fibers and, more preferably, wood pulp fibers. The cellulosic fibers, such as wood pulp fibers, can be chemically treated and predried prior to forming, if desired. Examples of wood pulp fibers include various mechanical and chemical pulp fibers, such as cedar fibers, Southern pine fibers, spruce fibers, and hemlock fibers. The particular cellulosic fibers selected to make the non-woven web

depend, in part, upon the type of texture, such as soft, woolly, or fluffy, and the porosity of the web that is desired. Alternatively, the fibers can be a combination of cellulosic and synthetic fibers.

The weight of the fibers, such as cellulosic fibers, used to form the unbonded fibrous web can vary depending upon the ultimate non-woven web that is produced. Typically, the weight of the fibers forming the web will vary within the range of about 5 x 0.454 kg (5 lbs.) per ream to about 60 x 0.454 kg (60 lbs). per ream.

Various web forming techniques known in the art can be effectively used to form the unbonded fibers. The web can be formed by non-woven techniques, such as air-laying the web or wet-laying the web. One type of apparatus for air forming fibers is shown in U.S. Patent No. 4,292,271 to Buob et al. Other non-woven manufacturing techniques, such as melt blown, bonding, spun bonded, needle punched, and spun laced, may also be used along with the substantive antimicrobial agent to provide antimicrobially active webs. Some of the processing and cost benefits may be lost through the choice of these processes along with their concomitant raw materials limitations.

In accordance with the present invention, an uncured binder and an antimicrobial agent are applied throughout the unbonded fibrous web with the antimicrobial agent being substantive to the fibers of the web and to the binder when the web is either wet or dry. Various binders known in the art can be used. A preferred binder is a polymeric binder, such as a latex bidder. Acceptable latex binders include acrylate emulsions, butadiene-styrene emulsions, ethylene vinyl acetate emulsions and acrylonitrile-butadiene emulsions. An especially effective latex binder is ethylene vinyl acetate, which is sold underthe trademark AIRFLEX A-410 by Air Products, Inc. of Allentown, Pennsylvania. The binder can also include a mixture of anionic and nonionic binders, such as ethylene vinyl acetate, which is sold under the trademark AIRFLEX A-106 by Air Products, Inc. and ethylene acetate, sold under the trademark HA-8 by Rohm, Haas, of Philadelphia, Pennsylvania.

The amount of the binder that is to be applied to the fibers depends, in part, upon the type of fibers, such as cellulosic, and the antimicrobial agent being used in the non-woven web. Typically, the amount of the binder applied to the fibers varies within the range of about 5% to about 30%. Similarly, the amount of solids in the binder, especially a latex binder, depends, inter alia, on the weight of the fibers in the non-woven web. Generally, latex binders having from about 5% to about 25% solids are used. Of course, the skilled artisan can select the particular binder, the amount of the binder used, and the amount of solids present in the binder depending upon, in part, the type of fibers that are to be bound. The binder is applied to the fibers by various techniques known in the art, such as spraying, foaming, or padding.

The antimicrobial agent is selected to be substantive to both the fibers of the web and to the binder when the web is either wet or dry. As used herein, an antimicrobial agent is substantive if the antimicrobial agent attaches directly to the fibers of the web and to the binder without the need for an adhesive substance. Substantive antimicrobial agents do not substantially diffuse from the fibers or the binder used to bind the fibers together.

Preferred antimicrobial agents are organo-silicon quaternary ammonium salts, such as a silyl-quaternary ammonium salt. Preferred organo-silicon quaternary ammonium salts are 3-(trimethoxysilyl) propyldidecylmethyl ammonium salts, such as 3-(trimethoxysilyl) propyldidecylmethyl ammonium chloride, and 3-(trimethoxysilyl) propyloctadecyldimethyl ammonium chloride.

The antimicrobial agent is preferably applied to the fibrous web prior to or simultaneously with the application of the binder. Although various amounts of the antimicrobial agent are applied to the web depending upon, in part, the fibers selected and the particular binder used, the amount of the antimicrobial active agent is typically in the range of about 0.25% to about 3% of the total web weight.

The antimicrobial agent is selected to be substantive to the binder in addition to being substantive to the fibers of the web. Hence, such an antimicrobial agent attaches directly to the binder and the cellulosic fibers without the need for an adhesive substance. Likewise, the ionic character of the binder is carefully chosen so that the antimicrobial active agent is usually substantially inert with respect to the binder to prevent ionic interaction of the antimicrobial agent and the binder.

The antimicrobial agent can be prepared by various techniques know in the art. For example, U.S. Patent Nos. 4,406,892 to Eudy, 4,282,366 to Eudy, 4,394,378 to Klein, and 4,408,996 to Baldwin describe various organo-silicon quaternary ammonium compounds, especially silyl quaternary ammonium compounds, and methods of preparing these compounds. Likewise, articles in the scientific literature, such as Walters et al., Algicidal Activity of a Surface-Bonded Organosilicon Quaternary Ammonium Chloride, 25 Applied Microbiology, 253-256 (1972) and Isquith et al., Surface-Bonded Antimicrobial Activity of an Organosilicon Quaternary Ammonium Chloride, 24 Applied Microbiology, 859-863 (1972), also disclose methods of preparing the desired organosilicon quaternary ammonium compound.

The uncured binder and the antimicrobial agent are applied to the unbonded fibers in a manner that

allows the binder and the antimicrobial agent to be present throughout the unbonded fibrous web and, hence, substantially uniformly distributed on the fibers. Accordingly, substantially all of the unbonded fibers of the web are to be contacted with the uncured binder and the antimicrobial agent during this application process.

Various application methods and apparatus, known in the art can be readily selected by the skilled artisan. For example, the uncured binder and the antimicrobial agent are sprayed onto unbound fibers, such as cellulosic fibers, that have been airlaid on a foraminous support. Similarly, the uncured binder and the antimicrobial agent can be contained in a bath through which the unbonded fibers pass. Other methods and apparatus include foaming and printing.

In accordance with the present invention, the binder material is cured to bind the fibers together to form an antimicrobial, non-woven web. Various curing techniques known in the art, such as infra-red radiation, electron beam, and forced hot air, can be effectively selected and used by the skilled artisan to achieve the proper degree of binder cure.

As a result, the present invention provides an antimicrobially active, non-woven web. The non-woven web has bonded fibers; a binder substantially uniformly distributed on the fibers, the binder being present in an amount effective to bind the fibers; and an antimicrobial agent substantially uniformly distributed on the fibers, the antimicrobial agent being substantive to the fibers and to the binder when the web is either wet or dry. The amount of the antimicrobial agent present within the non-woven web is preferably in the range of about 0.25% to about 3% of the total web weight. The amount of the binder present within the non-woven web is preferably in the range of about 5% to about 30% of the total web weight.

When the antimicrobially active, non-woven web of the present invention is present in a substantially preservative free liquid, an antimicrobial active wet wiper is achieved. The substantially preservative free liquid, such as water, maintains the web in a wet condition until use.

Other antimicrobial agents that are substantive to the fibers and the binder may also be used. In the case of wet wipers, the governing criteria are substantivity, antimicrobial activity, and safety, such that the wet wiper is safe for use on human skin and eyes.

The followig is an example of the present invention, and it is intended to be merely exemplary.

EXAMPLE

An antimicrobially active, air-laid, non-woven web was prepared in accordance with the present invention. Unbonded cellulosic fibers were air-laid to produce an unbonded cellulosic fiber web of 40 pounds per ream. AIRFLEX 410, which is an acetate vinyl ethylene latex binder sold by Air Products, Inc. of Pennsylvania, and SIQUAT biocide were applied throughout the unbonded cellulosic fiber web as a combination of binder and antimicrobial agent. SIQUAT is 3-(trimethoxysilyl) propyldidecylmethyl ammonium chloride sold under the trademark SIQUAT by Sanitized, Inc. Upon application, the antimicrobial agent was substantive both to the cellulosic fibers of the web and to the binder when the web is either wet or dry. The binder was then cured to bind the cellulosic fibers together.

The resulting air-laid, non-woven web was tested to determine its antimicrobial activity. Specifically, the non-woven web was tested to determine its effect on reduction and inhibition of five United States Pharmacopeia (U.S.P.) antimicrobial preservative effectiveness challenge organisms in a 28 day challenge test. The U.S.P. XX Preservative Effectiveness Test was modified to inoculate samples of the non-woven webs in the form of wet wiper towelettes. Those skilled in the art are readily familiar with the U.S.P. 28 day challenge test techniques and implications.

Basically, the wet wiper towelettes were subjected to an insult inoculation of five pathogenic microorganisms identified in the U.S.P. 28 day challenge test: Asperqillus niger, Candida albicans, Staphylococcus aureus, Pseudomonas aeruginosa, and Escherichia coliformia with total inoculation levels of 10^5 to 10^6 microorganisms/ml. The results of the 28 day challenge tests are provided in Table 1.

TABLE NO. 1

Day 1	Inoculum level/gram	Average
An	3.3×10^4/g	267/g
Ca	3.3×10^4/g	33/g
Sa	2.3×10^6/g	33/g
Pa	4.7×10^5/g	33/g
Ec	4.7×10^5/g	33/g
WEEK 1		
An		33/g
Ca		33/g
Sa		33/g
Pa		33/g
Ec		33/g
WEEK 2		
An		33/g
Ca		33/g
Sa		33/g
Pa		33/g
Ec		33/g
WEEK 3		
An		33/g
Ca		33/g
Sa		33/g
Pa		33/g
Ec		33/g
WEEK 4 Plated:		

An	33/g
Ca	33/g
Sa	33/g
Pa	33/g
Ec	33/g

The presevative is considered effective in the product examined if: (a) the concentration of viable bacteria is reduced to not more than 0.1% of the initial concentrations by the fourteenth day; (b) the concentrations of viable yeasts and molds remain at or below the initial concentrations during the first fourteen days; and (c) the concentration of each test microorganism remains at or below these designated levels during the remainder of the 28 day test period.

All five microorganisms reduced in numbers by a factor of 10^4 or more. Accordingly, the antimicrobial activity of the towelettes was rated as being excellent.

Claims

1. A method for making an antimicrobially active, non-woven web comprising the steps of:
   (a) forming an unbonded fibrous web:
   (b) applying throughout the unbonded fibrous web an uncured binder and an antimicrobial agent, the antimicrobial agent being substantive to the fibres of the web and to the binder when the web is either wet or dry; and
   (c) curing the binder to bind the fibres together to form an antimicrobially active, non-woven web.

2. A method according to claim 1, wherein the fibres are selected from the group consisting of cellulosic fibres, synthetic fibres, and combinations thereof.

3. A method according to claim 1, wherein the antimicrobial agent is an organo-silicon quaternary ammonium salt.

4. A method according to claim 1, wherein the unbonded fibrous web is formed by air-laying.

5. A method according to claim 1, wherein the unbonded fibrous web is formed by wet-laying.

6. A method for making an antimicrobially active air-laid non-woven web comprising the steps of:
   (a) air laying an unbonded cellulosic fiber web,
   (b) applying throughout the unbonded cellulosic fiber web an uncured polymeric binder and an antimicrobial agent, the antimicrobial agent being an organo-silicon quaternary ammonium salt substantive to the cellulosic fibers of the web and to the polymeric binder when the web is either wet or dry; and
   (c) curing the binder to bind the cellulosic fibres together to form an antimicrobially active, air-laid, non-woven web.

7. A method according to claim 3 or claim 6, wherein the organosilicon quaternary ammonium salt is selected from the group consisting of 3-(trimethoxysilyl) propyldidecylmethyl ammonium salt and 3-(trimethoxysilyl) propyloctadecyldimethyl ammonium salt.

8. A method according to claim 7, wherein the salt has a chloride anion.

9. A method according to claim 1 wherein the binder is a polymeric binder.

10. A method according to claim 6 or claim 9, wherein the polymeric binder is a latex binder.

11. A method according to claim 1 or claim 6, wherein the amount of the antimicrobial agent applied to the web is in the range of about 0.25% to about 3% of the total web weight.

12. A method according to claim 1 or claim 6, wherein the amount of the binder applied to the web is in the range of about 5% to about 30% of the total web weight.

13. A method according to claim 1 or claim 6, wherein the antimicrobial agent is safe for contact with human skin and eyes.

14. An antimicrobially active, non-woven web comprising:
(a) bonded fibres;
(b) a binder substantially uniformly distributed on the fibres, the binder being present in an amount effective to bind the fibres; and
(c) an antimicrobial agent substantially uniformly distributed on the fibres, the antimicrobial agent being substantive to the fibres and to the binder when the web is either wet or dry.

15. A web according to claim 14, wherein the fibres are selected from the group consisting of cellulosic fibres, synthetic fibres, and combinations thereof.

16. A web according to claim 14, wherein the binder is a polymeric binder.

17. A web according to claim 16, wherein the polymeric binder is a latex binder.

18. A web according to claim 14, wherein the antimicrobial agent is an organo-silicon quaternary ammonium salt.

19. A web according to claim 18, wherein the organosilicon quaternary ammonium salt is selected from the group consisting of a 3-(trimethoxysilyl) propyldidecylmethyl ammonium salt and 3-(trimethoxysilyl) propyloctadecyldimethyl ammonium salt.

20. A web according to claim 19, wherein the salt has a chloride anion.

21. A web according to claim 14, wherein the amount of the antimicrobial agent is in the range of 0.25% to about 3% of the total web weight.

22. A web according to claim 14, wherein the amount of the binder is in the range of about 5% to about 30% of the total web weight.

23. A web according to claim 14, wherein the antimicrobial agent is safe for contact with human skin and eyes.

24. A web according to claim 14, wherein the bonded fibres are air-laid.

25. A web according to claim 14, wherein the bonded fibres are wet-laid.

26. An antimicrobially active wet wiper comprising:
(a) an antimicrobially active non-woven web comprising:
(i) bonded fibres;
(ii) a binder in an amount effective to bind the fibres;
(iii) an antimicrobial agent being substantive to the fibres and to the binder when the web is either wet or dry; and
(b) a substantially preservative free liquid in which the web is maintained in a wet condition until use.

27. A wet wiper according to claim 26 comprising an antimicrobially active non-woven web according to any one of claims 15 to 25.

Revendications

1. Procédé de fabrication d'un tissu non tissé, à activité antimicrobienne, comprenant les étapes consistant à :
(a) former un tissu fibreux non lié ;

(b) appliquer dans la masse du tissu fibreux non lié un liant non durci et un agent antimicrobien, l'agent antimicrobien étant substantif vis-à-vis des fibres du tissu et vis-à-vis du liant, que le tissu soit mouillé ou sec ; et
(c) durcir le liant pour lier les fibres entre elles pour former un tissu non tissé à activité antimicrobienne.

2. Procédé selon la revendication 1, dans lequel les fibres sont sélectionnées dans le groupe constitué par des fibres cellulosiques, des fibres synthétiques et des combinaisons de celles-ci.

3. Procédé selon la revendication 1, dans lequel l'agent antimicrobien est un sel d'ammonium quaternaire et d'organosilicium.

4. Procédé selon la revendication 1, dans lequel le tissu fibreux non lié est formé par application par jet d'air.

5. Procédé selon la revendication 1, dans lequel le tissu fibreux non lié est formé par application au mouillé.

6. Procédé de fabrication d'un tissu non tissé, appliqué par jet d'air, à activité antimicrobienne, comprenant les étapes consistant à :
(a) appliquer par jet d'air un tissu en fibres cellulosiques non liées,
(b) appliquer dans la masse du tissu de fibres cellulosiques non liées un liant polymérique non durci et un agent antimicrobien, l'agent antimicrobien étant un sel d'ammonium quaternaire et d'organosilicium substantif vis-à-vis des fibres cellulosiques du tissu et vis-à-vis du liant polymérique, que le tissu soit mouillé ou sec ;
(c) durcir le liant pour lier les fibres cellulosiques entre elles pour former un tissu non tissé, appliqué par jet d'air, à activité antimicrobienne.

7. Procédé selon la revendication 3 ou la revendication 6, dans lequel le sel d'ammonium quaternaire et d'organosilicium est sélectionné dans le groupe constitué par un sel de 3-(triméthoxysilyl)-propyldidécylméthylammonium et un sel de 3-(triméthoxysilyl)-propyloctadécyldiméthylammonium.

8. Procédé selon la revendication 7, dans lequel le sel possède un anion chlorure.

9. Procédé selon la revendication 1, dans lequel le liant est un liant polymérique.

10. Procédé selon la revendication 6 ou la revendication 9, dans lequel le liant polymérique est un liant au latex.

11. Procédé selon la revendication 1 ou la revendication 6, dans lequel la quantité d'agent antimicrobien appliquée sur le tissu est comprise dans la plage d'environ 0,25 % à environ 3 % du poids total du tissu.

12. Procédé selon la revendication 1 ou la revendication 6, dans lequel la quantité de liant appliquée sur le tissu est comprise dans la plage d'environ 5 % à environ 30 % du poids total du tissu.

13. Procédé selon la revendication 1 ou la revendication 6, dans lequel l'agent antimicrobien est inoffensif au contact avec la peau humaine et les yeux.

14. Tissu non tissé, à activité antimicrobienne, comprenant :
(a) des fibres liées ;
(b) un liant distribué de façon sensiblement uniforme sur les fibres, le liant étant présent en une quantité efficace pour lier les fibres ; et
(c) un agent antimicrobien distribué de façon sensiblement uniforme sur les fibres, l'agent antimicrobien étant substantif vis-à-vis des fibres et vis-à-vis du liant, que le tissu soit mouillé ou sec.

15. Tissu selon la revendication 14, dans lequel les fibres sont sélectionnées dans le groupe constitué par des fibres cellulosiques, des fibres synthétiques et des associations de celles-ci.

16. Tissu selon la revendication 14, dans lequel le liant est un liant polymérique.

17. Tissu selon la revendication 16, dans lequel le liant polymérique est un liant au latex.

18. Tissu selon la revendication 14, dans lequel l'agent antimicrobien est un sel d'ammonium quaternaire et d'organosilicium.

19. Tissu selon la revendication 18, dans lequel le sel d'ammonium quaternaire et d'organosilicium est sélectionné dans le groupe constitué par un sel de 3-(triméthoxysilyl)-propyldidécylméthylammonium et un sel de 3-(triméthoxysilyl)-propyloctadécyldiméthylammonium.

20. Tissu selon la revendication 19, dans lequel le sel possède un anion chlorure.

21. Tissu selon la revendication 14, dans lequel la quantité d'agent antimicrobien est comprise dans la plage de 0,25 % à environ 3 % du poids total du tissu.

22. Tissu selon la revendication 14, dans lequel la quantité de liant est comprise dans la plage d'environ 5 % à environ 30 % du poids total du tissu.

23. Tissu selon la revendication 14, dans lequel l'agent antimicrobien est inoffensif au contact avec la peau humaine et les yeux.

24. Tissu selon la revendication 14, dans lequel les fibres liées sont appliquées par jet d'air.

25. Tissu selon la revendication 14, dans lequel les fibres sont appliquées au mouillé.

26. Linge humide à activité antimicrobienne comprenant :
    (a) un tissu non tissé à activité antimicrobienne comprenant :
        (i) des fibres liées ;
        (ii) un liant en une quantité efficace pour lier les fibres ;
        (iii) un agent antimicrobien substantif vis-à-vis des fibres et vis-à-vis du liant, que le tissu soit mouillé ou sec ; et
    (b) un liquide sensiblement exempt d'agents de préservation dans lequel le tissu est maintenu à l'état humide jusqu'à son emploi.

27. Linge humide selon la revendication 26, comprenant un tissu non tissé à activité antimicrobienne selon l'une quelconque des revendications 15 à 25.

Patentansprüche

1. Verfahren zum Herstellen eines anti-mikrobiell wirksamen Vliesstoffes mit folgenden Schritten:
    (a) Bildung eines nicht gebundenen Faservlieses;
    (b) Einbringen eines nicht ausgehärteten Bindemittels sowie eines antimikrobiellen Mittels in das unbebundene Faservlies, wobei das antimikrobielle Mittel sowohl auf den Fasern des Vlieses wie auch auf dem Bindemittel im nassen oder trockenen Zustand haftet; und
    (c) Aushärten des Bindemittels, um die Fasern unter Bildung eines antimikrobiell aktiven Vliesstoffes a neinanderzubinden.

2. Verfahren nach Anspruch 1, bei welchem die Fasern aus der Gruppe der Zellulosefasern, der synthetischen Fasern oder Kombinationen dieser beiden ausgesucht sind.

3. Verfahren nach Anspruch 1, bei welchem das antimikrobielle Mittel ein organo-silikonisches quaternäres Ammoniumsalz ist.

4. Verfahren nach Anspruch 1, bei welchem das ungebundene Faservlies nach dem Luftlegeverfahren geformt wird.

5. Verfahren nach Anspruch 1, bei welchem das unbebundene Faservlies durch Naßlegen geformt wird.

6. Verfahren zum Herstellen eines antimikrobiell aktiven luftgelegten Vliesstoffes mit folgenden Schritten:
(a) Luftlegen eines ungebundenen Vlieses aus Zellstoff-Fasern,
(b) Einbringen eines nichtausgehärteten Polymerbinders und eines antimikrobiellen Mittels in das ungebundene Zellstoffvlies, wobei das antimikrobielle Mittel ein organo-silikonisches quaternäres Ammoniumsalz und sowohl auf die Zellstoff-Fasern des Vliesstoffes wie auch auf den polymeren Binder im nassen oder trockenen Zustand des Vlieses haftet und
(c) Aushärten des Binders, um die Zellstoff-Fasern miteinander unter Bildung eines antimikrobiell aktiven luftgelegten Vliesstoffes miteinander zu verbinden.

7. Verfahren nach Anspruch 3 oder 6, bei welchem das organo-silikonische quaternäre Ammoniumsalz aus der Gruppe der 3(trimethoxysilyl)-propyldidecylmethyl-Ammoniumsalze und der 3-(trimethoxysilyl)-propyloctadecylmethyl-Ammoniumsalze ausgesucht ist.

8. Verfahren nach Anspruch 7, bei welchem das Salz ein Chloridanion enthält.

9. Verfahren nach Anspruch 1, bei welchem das Bindemittel ein polymeres Bindemittel ist.

10. Verfahren nach Anspruch 6 oder 9, bei welchem das polymere Bindemittel ein Latexbinder ist.

11. Verfahren nach Anspruch 1 oder 6, bei welchem das antimikrobielle Mittel, welches dem Vlies zugeführt wird, in Mengen von etwa 0,25% bis etwa 3% des gesamten Vliesgewichtes vorhanden ist.

12. Verfahren nach Anspruch 1 oder 6, bei welchem das dem Vlies zugeführte Bindemittel in Mengen von etwa 5% bis etwa 30% des gesamten Vliesgewichtes vorhanden ist.

13. Verfahren nach Anspruch 1 oder 6, in welchem das antimikrobielle Mittel unschädlich bei Berührung mit der menschlichen Haut sowie den Augen ist.

14. Antimikrobiell aktiver Vliesstoff enthaltend:
(a) Gebundene Fasern;
(b) ein im wesentlichen gleichförmig auf den Fasern verteiltes Bindemittel, wobei dieses Bindemittel in einer Menge vorhanden ist, die ausreicht, um die Fasern miteinander zu verbinden und
(c) ein antimikrobielles Mittel, welches im wesentlichen gleichförmig auf den Fasern verteilt ist, wobei das antimikrobielle Mittel im nassen und trockenen Zustand auf den Fasern und dem Bindemittel haftet.

15. Vliesstoff nach Anspruch 14, bei welchem die Fasern aus der Gruppe der Zellstoff-Fasern, der synthetischen Fasern sowie Kombinationen davon ausgesucht sind.

16. Vliesstoff nach Anspruch 14, bei welchem das Bindemittel ein polymeres Bindemittel ist.

17. Vliesstoff nach Anspruch 16, bei welchem das polymere Bindemittel ein Latexbinder ist.

18. Vliesstoff nach Anspruch 14, bei welchem das antimikrobielle Mittel ein organo-silikonisches quaternäres Ammoniumsalz ist.

19. Vliesstoff nach Anspruch 18, bei welchem das organo-silikonische quaternäre Ammoniumsalz ausgesucht ist aus der Gruppe der 3-(trimethoxysilyl)-propyldidecylmethyl-Ammoniumsalze und der 3-(trimethoxysilyl)-propyloctadecyldimethyl-Ammoniumsalze.

20. Vliesstoff nach Anspruch 19, bei welchem das Salz ein Chloridanion aufweist.

21. Vliesstoff nach Anspruch 14, bei welchem die Menge des antimikrobiellen Mittels im Bereich von 0,25% bis ca. 3% des gesamten Vliesgewichtes liegt.

22. Vliesstoff nach Anspruch 14, bei welchem die Menge des Bindemittels im Bereich von ungefähr 5% bis ungefähr 30% des gesamten Vliesstoffgewichtes liegt.

23. Vliesstoff nach Anspruch 14, bei welchem das anitmikrobielle Mittel beim Kontakt mit der menschlichen Haut und den Augen unschädlich ist.

24. Vliesstoff nach Anspruch 14, bei welchem die gebundenen Fasern luftgelegt sind.

25. Vliesstoff nach Anspruch 14, bei welchem die gebundenen Fasern naßgelegt sind.

26. Antimikrobiell wirksames Feuchtreinigungstuch mit:
    (a) einem antimikrobiell aktiven Vliesstoff enthaltend:
        (i) gebundene Fasern;
        (ii) ein Bindemittel in einer Menge, die ausreicht, um die Fasern miteinander zu verbinden;
        (iii) ein antimikrobielles Mittel, welches im nassen oder im trockenen Zustand auf den Fasern und dem Bindemittel haftet;
    (b) eine im wesentlichen schutzmittelfreie Flüssigkeit, in der der Vliesstoff enthalten ist und die ihn während des Gebrauches feucht hält.

27. Feuchtreinigungstuch nach Anspruch 26, welches einen antimikrobiell wirksamen Vliesstoff nach einem der Ansprüche 15 bis 25 enthält.